



International Center  
for Scientific Debate  
BARCELONA



# BRAIN HEALTH

FROM GENES TO BEHAVIOUR,  
IMPROVING OUR LIFE

October, 6<sup>th</sup> and 7<sup>th</sup>, 2015

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WITH THE COLLABORATION OF:



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# B·Debate

## International Center for Scientific Debate

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**BARCELONA**

**“B·Debate strives to help position Barcelona as a benchmark in generating knowledge and Catalonia as a country of scientific excellence”**

B·Debate is an initiative of Biocat with support from “la Caixa” Foundation which aims to drive top-notch international scientific events to foster debate, collaboration and open exchange of knowledge among experts of renowned national and international prestige. The debates are focused on the integration of diverse disciplines of science in order to tackle major scientific and societal challenges.

# BRAIN HEALTH

FROM GENES TO BEHAVIOR,  
IMPROVING OUR LIFE

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# BRAIN HEALTH

FROM GENES TO BEHAVIOR,  
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October, 6<sup>th</sup> and 7<sup>th</sup>, 2015

## WELCOME

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Dear colleagues and friends,

On behalf of the Organizing Committee, it is our great pleasure to welcome speakers and attendees to the B-DEBATE workshop on Brain Health. This scientific debate has been aimed to promote cooperative thinking about the neurobiological mechanisms responsible to keep the optimal network of neural connections allowing us to maintain our social engagement, a level of autonomy sufficient to live meaningful and independent lives, and resist and recover from injuries or illnesses.

Understanding the human brain is one of the greatest challenges for 21st century science. The “Human Brain project”, a flagship project of the European Union, and the “BRAIN Initiative” (Research through Advancing Innovative Neurotechnologies), at the US, aim to gain profound insights into what makes us human, develop new treatments for brain diseases, and build revolutionary new computing technologies through the convergence of neuroscience, medicine, and computing. Through the B-Debate on Brain Health, we will think together about how we can use all this growing body of knowledge, harnessing brain plasticity to improve our lives.

We are extremely thankful to the Scientific Committee for assembling such a selected group of speakers, from different disciplines, sharing the common endeavor of promoting recovery of neurological lesions. We hope that the joint contributions of speakers and attendees will enrich our thinking and provide an stimulating unique atmosphere to each one of us, building up new thinking as the germ for innovative and, probably, interdisciplinary approaches.

We would also like to thank Fundació Abertis, the BILAT USA 2.0 Project and the BIDMC Brain Fit Club for allowing us to welcome you in Barcelona and to share the opportunity of joining efforts in pushing away frontiers for building up a better world.

Josep M. Ramírez (General Manager of Institut Guttmann) and B-DEBATE (Biocat and “la Caixa” Foundation)

# PROGRAM

Tuesday, October, 6<sup>th</sup>, 2015

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9:15 **Welcome**

**Enric Banda**, Director of the Department of Science and Environment, “la Caixa” Foundation, Barcelona

**Laia Arnal**, Head of Scientific Debate, Biocat, Barcelona

**Josep Ma. Tormos**, Research Director, Institut Guttmann, Barcelona

9:30 **SESSION 1: WHAT ARE EXISTING OR NEEDED TOOLS TO BETTER UNDERSTAND HUMAN BRAIN FUNCTION?**

Chair: **Montserrat Bernabeu**, Institut Guttmann, Barcelona, Spain

9:40 **Genomic Analysis of Neurodegenerative Disease**

**John Hardy**, University College of London, London, UK

10:10 **Promoting Brain Health: Characterizing and Guiding the Changing Brain Across the Lifespan**

**Alvaro Pascual-Leone**, Harvard University, Boston, USA

10:40 **Robot Assisted Rehabilitation: the MIT Perspective**

**Hermano Igo Krebs**, MIT, Boston, USA

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11:10 **Coffee Break**

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11:40 **SESSION 2: WHAT DO WE NEED AND WHAT CAN WE EXPECT FROM STRUCTURAL AND FUNCTIONAL BRAIN MAPPING?**

Chair: **Gerard Conesa**, Universitat de Barcelona, Barcelona, Spain

11:50 **The Human Connectome: Towards Whole-Brain Modeling**

**Gustavo Deco**, Universitat Pompeu Fabra, Barcelona, Spain

12:20 **The Human Brain Project - The Impact of Informatics on Treatment of Brain Diseases**

**Richard Frackowiak**, CHUV University Hospital, Switzerland

12:50 **Using the Human Connectome to Understand Neurological Symptoms and Guide Treatment**

**Michael Fox**, Harvard University, Boston, USA

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13:30 **Lunch**

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15:00 **SESSION 3: WHAT BIOLOGICAL, PSYCHOLOGICAL AND ENVIRONMENTAL FACTORS INFLUENCE BRAIN DEVELOPMENT SINCE CHILDHOOD AND ACROSS THE LIFESPAN?**

Chair: **Rocío Sanchez-Carrión**, Institut Guttmann, Barcelona, Spain

15:10 **Perceptual Foundations of Language Acquisition**

**Janet Werker**, University of British Columbia, Vancouver, Canada

15:40 **Prenatal Origins of Abnormal Brain Development**

**Elisenda Eixarch**, Universitat de Barcelona, Barcelona, Spain

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16:10 **Coffee Break**

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16:40 **How Environment Takes Advantage of Biological Constraints to Shape Early Brain Development**

**Ghislaine Dehaene-Lambertz**, INSERM-CEA, Paris, France

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17:10 **Open Debate**

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17:50 **Summary and Remarks of the Day**

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# PROGRAM

Wednesday, October, 7<sup>th</sup>, 2015

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9:00 **SESSION 4: WHAT ARE THE RIGHT INTEGRATIVE APPROACHES TO CHARACTERIZE AND MODULATE BRAIN FUNCTION?**

Chair: **Eduard Vieta**, Hospital Clínic, Barcelona, Spain

9:10 **Exercising Your Mind & Brain**

**Arthur Kramer**, University of Illinois, Illinois, USA

9:40 **Action Videogames as Exemplary Learning Tools**

**Daphne Bavelier**, University of Geneva, CH and University of Rochester, USA

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10:10 **Coffee Break**

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10:40 **The Mediterranean Diet and Improved Cognitive Outcomes: Evidence from the PREDIMED Trial**

**Emilio Ros**, University of Barcelona, Barcelona, Spain

11:10 **Evidence-Based Brain Health Approaches in Practice: The Brain Fit Club**

**Bonnie Wong**, Harvard University, Massachusetts, USA

11:50 **SESSION 5: WHAT ARE THE CLINICAL, PUBLIC HEALTH AND EDUCATIONAL IMPLICATIONS OF BRAIN HEALTH, PREVENTION AND LONG TERM CARE?**

Chair: **Àngels Bayés**, Teknon Medical Center, Barcelona, Spain

12:00 **Brain Health in Neurodegenerative Disease**

**Jaime Kulisevsky**, Universitat Oberta de Catalunya, Barcelona, Spain

12:30 **Coaching the Brain for Good**

**Margaret Moore**, Harvard University, Massachusetts, USA

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13:00 **Summary and Conclusion Remarks**

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# SCIENTIFIC COMMITTEE

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**Jose Maria Tormos**, Research Director, **Institut Guttmann**, Barcelona, Spain

Jose M Tomos Muñoz is MD and PhD by the University of Valencia. His doctoral thesis was aimed to study the parameters of noninvasive brain stimulation for modulating cortical excitability and modulation design strategies to optimize rehabilitation outcomes. He was post doctoral researcher affiliated to the Berenson-Allen Center for Noninvasive Brain Stimulation, under the direction of Prof. Alvaro Pascual-Leone, at Harvard University. He was Associate Professor of the Dep. of Medicine at the University of Valencia. In his work he has demonstrated the noninvasive brain stimulation in the treatment of depression, aphasia rehabilitation and treatment of movement disorders such as Parkinson's stiffness, focal dystonia, or idiopathic scoliosis. Since 2003 he is research director of

Institut Guttmann. He has participated in research projects of the AVANZA, INNPACTO, CENIT, ETES, IMSERSO R & D, CENIT, FP6 and FP7 programs, and has been Host researcher of one of the BBVA chairs for translational research. He is director of the Master in Neurorehabilitation of the Guttmann Neurorehabilitation Institute. He is author of over 60 scientific articles on subjects related to neuronal plasticity and strategies for assessment and modulation of the plastic changes in clinical settings, aimed at optimizing the result of interventions in neurorehabilitation, and is co-author of 4 patents in the field of neurotechnologies.

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**Montserrat Bernabeu**, Head of Acquired Brain Damage Unit, **Institut Guttmann**, Barcelona, Spain

Montserrat Bernabeu is a specialist in Physical and Rehabilitation Medicine at the Institut Guttmann Neurorehabilitation Hospital in Badalona since 1993. She started and, currently, leads the Brain Injury Unit which main goal is to provide rehabilitation treatment to people suffering sequel from any moderate/severe Acquired Brain Injury within an interdisciplinary framework and under high quality standards (JCI). She was born in Barcelona, Spain. She received her bachelor of Medicine and Surgery in 1988 from the University of Barcelona, and performed her Physical and Rehabilitation training at

the Universidad Autònoma de Barcelona obtaining the specialist degree in 1992. She has been board member of the Catalan P&RM Society, she is a founder member of Spanish Society of Neurorehabilitation and she has been the President from 2004 to 2012. As a researcher she has taken part in several European projects dealing with new technologies in rehabilitation and was the Project Director of the ICF TBI-Core Sets which has been carried out in cooperation with the ICF Research Branch (DIMDI) at the Ludwig-Maximilians University in Munich, Germany. She is co-author of more than forty scientific papers dealing with different aspects of brain injury and is also a Board Member of International Journal of Rehabilitation Research Review.

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**Antònia Enseñat**, Head of the Neuro-Psycho-Social Rehabilitation Department, **Institut Guttmann**, Barcelona, Spain

Antònia Enseñat received her bachelor of Psychology in 1991 from the Universitat Autònoma de Barcelona, and performed her Clinical Psychology Specialization in the same University in 2004. She is expert in Clinical Neuropsychology and has a Master's Degree in Clinical Neuropsychology and Cognitive Stimulation (Institut Guttmann-UAB). She is the author of several publications and has participated as a researcher in various projects, both Spanish and European: "PREVIRNEC, virtual reality platform for Neuropsychological Rehabilitation" (DURSI); "Clinical Leading Environment for the Assessment and validation of Rehabilitation Protocols for home care, CLEAR", "Enhancing

laboratory measures of autonomy, personal satisfaction and quality of life of people with spinal cord injury or acquired brain injury" (IMSERSO); or "Telemedical system of Neuropsychological Intervention based on Interactive Virtual Environments" (PLAN AVANZA TSI-020501-2008-154, among others. Her main lines of expertise are Neuropsychological evaluation and treatment of patients (adults and children) who have suffered brain injury, and Pediatric neuropsychology.

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**Alvaro Pascual-Leone**, Professor of Neurology and Associate Dean for Clinical and Translational Research at **Harvard Medical School**, Boston, USA

Dr. Pascual-Leone is Professor of Neurology and Associate Dean for Clinical and Translational Research at Harvard Medical School. He continues to practice as a cognitive neurologist, and serves as Chief of the Division of Cognitive Neurology at Beth Israel Deaconess Medical Center. He is committed neuroscientist, teacher and mentor, with ample experience in clinical research across T domains, from T1/2 to T4, and is an internationally recognized pioneer in the field of noninvasive brain stimulation with contributions that span from technology development, through basic neurobiologic from animal studies and modeling approaches, to human proof-of-principle and multicenter clinical trials. His

research combines brain imaging and brain stimulation to characterize brain plasticity and network dynamics across lifespan in health and disease, and modulate them to restore function, promote recovery, and prevent cognitive disability and decline. His work has been recognized with a number of national and international awards, and ample public press and television coverage.

# INVITED SPEAKERS

Tuesday, October, 6<sup>th</sup>, 2015



**Montserrat Bernabeu**, Head of Acquired Brain Damage Unit, **Institut Guttmann**, Barcelona, Spain

Chair of the **SESSION 1: WHAT ARE EXISTING OR NEEDED TOOLS TO BETTER UNDERSTAND HUMAN BRAIN FUNCTION?**

See her CV at the Scientific Committee Section



**John Hardy**, Professor of Molecular Neuroscience, Reta Lilla Weston Laboratories, **UCL Institute of Neurology**, London, UK

Prof John Hardy is a geneticist and molecular biologist whose research interests focus on neurological disease. Dr. Hardy received his B.Sc. (Hons) degree from the University of Leeds, UK (1976) and his Ph.D. from Imperial College, London, UK where he studied dopamine and amino acid neuropharmacology. Dr. Hardy received his postdoctoral training at the MRC Neuropathogenesis Unit in Newcastle upon Tyne, UK and then further postdoctoral work at the Swedish Brain Bank in Umeå, Sweden where he started to work on Alzheimer's disease. He became Assistant Professor of Biochemistry at St. Mary's Hospital, Imperial College, London in 1985 and initiated genetic studies of Alzheimer's disease whilst there. He was appointed Associate Professor in 1989 and then took the Pfeiffer Endowed Chair of Alzheimer's Research at the University of South Florida, in Tampa in 1992. In 1996 he moved to the Mayo Clinic in Jacksonville, Florida, as Consultant and Professor of Neuroscience. He became Chair of Neuroscience in 2000 and moved to NIA as Chief of the Laboratory of Neurogenetics in 2001. He won the MetLife, the Allied Signal and the Potamkin Prize for his work in describing the first genetic mutations, in the amyloid gene in Alzheimer's disease, in 1991. He was Head of the Neurogenetics Section, National Institute of Ageing, Bethesda, USA and in 2007 took up the Chair of Molecular Biology of Neurological Disease at the UCL Institute of Neurology. With over 23,000 citations, He was elected a Fellow of the Royal Society in 2009, and a Fellow of the European Molecular Biology Organisation in 2013.

## Genomic Analysis of Neurodegenerative Disease

Because of the advances in DNA/RNA chip and sequencing technologies it is now possible to systematically find any type of genetic risk. Mutations which cause disease can be found by positional cloning and exome or genome sequencing, high risk loci can be identified through exome sequencing and burden analysis and low risk, common variants can be found by genome wide association studies. These technological advances have resulted in the identification of a very large number of pathogenic loci for many neurological syndromes including dementias and parkinsonisms. Coupled with these genetic advances, the same technologies also allow us to assess gene expression in a genome wide and systematic way. In his lecture he will summarise the genetic advances for all the major neurodegenerative diseases and discuss how bioinformatic analysis is now allowing us to make sense of these findings and helping us to move from seeing pathogenesis one gene at a time, to seeing pathogenesis as a process involving connected networks of genes and proteins.



**Alvaro Pascual-Leone**, Professor of Neurology and Associate Dean for Clinical and Translational Research at **Harvard Medical School**, Boston, USA

See his CV at the Scientific Committee Section

## Promoting Brain Health: Characterizing and Guiding the Changing Brain Across the Lifespan

The brain changes across the lifespan. This life-long brain plasticity can be conceptualized as nature's invention to overcome limitations of the genome and adapt to a rapidly changing environment. However, mechanisms of plasticity and the resulting brain dynamics vary across individuals and are modified by genetic predispositions, environmental influences, life experiences and even age. The average age of the world's population is increasing at an unprecedented rate, and aging is associated with declines in a number of cognitive domains and is also the major risk factor for dementia. Maintenance of cognitive function is fundamental not only for preserved cognition, but also for overall health across the lifespan. Despite important advances in medicine and very large financial expenditures, morbidity and disability across aging remain an enormous burden. Unless we minimize the debilitating cognitive decline associated with aging and the additional cost of neurodegenerative disorders, we risk succumbing to the staggering personal, social, and economic burdens of aging. Innovative experimental paradigms can assess cortical plasticity in humans, in vivo, across the lifespan. Ultimately, changes in brain plasticity and dynamics may prove maladaptive and



lead to disease. Aberrant, excessive or insufficient, or mistimed plasticity may represent the proximal pathogenic cause of neurodevelopmental and neurodegenerative disorders such as autism spectrum disorders, schizophrenia, or Alzheimer's disease. On the other hand, optimizing brain dynamics can promote brain health, sustain cognitive function and well-being across the life-span, minimize the risk for dementia and neurodegenerative disorders, promote functional compensation and repair of the damaged brain, optimize coping with diseases of the nervous system, and leverage the impact of brain function on overall health (salutogenesis) to improve the control of medical diseases and minimize their functional impact. This is the goal of the Brain Fit Club at Beth Israel Deaconess Medical Center, Harvard Medical School ([www.tmslab.org](http://www.tmslab.org)), which holds the promise to transform society via the development of evidence-based technologies and interventions aimed at the prevention of neurocognitive decline and the maintenance of cognitive abilities across the lifespan, thus extending overall health, societal productivity, and quality of life for all.

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**Hermano Igo Krebs**, Principal Research Scientist & Lecturer, Mechanical Engineering Department, **Massachusetts Institute of Technology**, Cambridge, USA

Hermano Igo Krebs joined MIT's Mechanical Engineering Department in 1997 where he is a Principal Research Scientist and Lecturer – Newman Laboratory for Biomechanics and Human Rehabilitation. He also holds an affiliate position as an Adjunct Professor at University of Maryland School of Medicine, Department of Neurology, and as a Visiting Professor at Fujita Health University, Department of Physical Medicine and Rehabilitation, at University of Newcastle, Institute of Neuroscience, and at the Mechanical Engineering Department of Osaka University. He is one of the founders and member of the Board of Directors of Interactive Motion Technologies, a Massachusetts-based company commercializing robot technology for rehabilitation. He is a Fellow of the IEEE (Institute of Electrical and Electronics Engineers). Dr. Krebs was nominated by two of IEEE societies: IEEE-EMBS (Engineering in Medicine & Biology Society) and IEEE-RAS (Robotics and Automation Society) to this distinguished engineering status “for contributions to rehabilitation robotics and the understanding of neuro-rehabilitation.” Dr. Krebs has published and presented extensively on rehabilitation robotics, particularly applied to stroke and neuro-recovery. His work goes beyond Stroke and has been extended to Cerebral Palsy for which he received “The 2009 Isabelle and Leonard H. Goldenson Technology and Rehabilitation Award,” from the Cerebral Palsy International Research Foundation (CPIRF). In 2015, he received the prestigious IEEE-INABA Technical Award for Innovation leading to Production “for contributions to medical technology innovation and translation into commercial applications for Rehabilitation Robotics.” His goal is to revolutionize the way rehabilitation medicine is practiced today by applying robotics and information technology to assist, enhance, and quantify rehabilitation.

#### **Robot Assisted Rehabilitation: the MIT Perspective**

The field of rehabilitation robotics has grown steadily over the past decade, making significant clinical contributions. Studies have demonstrated both the efficacy and advantages of robotics for assessing and treating motor impairment with guidelines, such as the 2010 American Heart Association's “Comprehensive Overview of Nursing and Interdisciplinary Rehabilitation Care of the Stroke Patient,” endorsing robotic therapy for the upper extremity (UE), but not for the lower extremity (LE) [1]. In 2010, the US Veterans Administration similarly endorsed robotic therapy for UE but not for LE: “recommendation is made against routinely providing the [LE] intervention... At least fair evidence was found that the intervention is ineffective...” [2] This apparent immaturity of LE robotic therapy reflects the fact that, to date, knowledge of human motor control has not been applied to LE robotic therapy. Knowledge of human motor control, sensing, and cognition has matured to the point that a fundamental and unifying theory of movement for both UE arm movement and for LE walking is now within reach. Here, I will discuss some of the evidence supporting our working model based on submovements, oscillations, and impedances for UE movement collected with the MIT-Manus [3-7] and how we plan to develop a competent model that encompass both arm movement and walking based on these elementary actions and how to code it into adaptive controllers that will allow multiple robotic devices to target rehabilitation [8].

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**Gerard Conesa**, **Universitat de Barcelona**, Barcelona, Spain

Chair of the **SESSION 2: WHAT DO WE NEED AND WHAT CAN WE EXPECT FROM STRUCTURAL AND FUNCTIONAL BRAIN MAPPING?**

Gerard Conesa has a degree in Medicine and Surgery at Universitat de Barcelona. He is Doctor in medicine and surgery by the Universtat de Barcelona. He has a large expertise in neurosurgery. He has more than 50 publications and collaborations both national and international. Since 2006 he is Head of the neurosurgery service at Hospital del Mar, and he is neurosurgeon at Clínica Sagrada Família and Hospital Quiron Barcelona since 1985 and 2007 respectively. He is also co-founder partner and director of Neurogrup since 2001.

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**Gustavo Deco**, ICREA Research Professor and Full Professor at the **Universitat Pompeu Fabra**, Barcelona, Spain

Gustavo Deco is ICREA Research Professor and Full Professor at the Universitat Pompeu Fabra, where he heads the Computational Neuroscience Group and directs the Center for Brain and Cognition. He studied Physics at the National University of Rosario. In 1987, he received his Ph.D. in Physics for his thesis on Relativistic Atomic Collisions. In 1997, he obtained his habilitation (maximal academical degree in Germany) in Computer Science at the Technical University of Munich for his thesis on Neural Learning. In 2001, he received his Ph.D. in Psychology at the Ludwig-Maximilian-University of Munich for his thesis on Visual Attention. His research interests include computational neuroscience,

neuropsychology, psycholinguistics, biological networks, statistical formulation of neural networks, and chaos theory. He has actively contributed to the modelling and integration of experimental measurements through theoretical frameworks, and collaborates with many experimentalists to confront theory and experiments. Recognised as a world leader in computational neuroscience, he has led pioneering work in dynamical modelling of human brain activity. He is an ERC Advanced grantee and member of the Human Brain Project.

### **The Human Connectome: Towards Whole-Brain Modeling**

Recently, the intriguing dynamics of the brain at rest has been attracting a growing body of research in neuroscience. Neuroimaging studies have revealed distinct functional networks that slowly activate and deactivate, pointing to the existence of an underlying network dynamics emerging spontaneously during rest, with specific spatial, temporal and spectral characteristics. Several theoretical scenarios have been proposed and tested with the use of large-scale computational models of coupled brain areas. However, a mechanistic explanation that encompasses all the phenomena observed in the brain during rest is still to come. We provide in this talk an overview of the key findings of resting-state activity covering a range of neuroimaging modalities including fMRI and MEG. We describe how to best define and analyze anatomical and functional brain networks and how unbalancing these networks may lead to problems with mental health. Finally, we review existing large-scale models of resting-state dynamics in health and disease.



**Richard Frackowiak**, Professor at the **Ecole Polytechnique Fédérale de Lausanne**, Switzerland

Richard Frackowiak holds a titular professorship at the Ecole Polytechnique Fédérale de Lausanne. He is a director of the EU's "Human Brain Project" responsible for medical informatics. A pioneer of human brain imaging research he developed methods and applied them to investigate human brain structure and function relationships in health and disease. Currently he is pioneering collaboration between modern informatics and brain medicine in the HBP. His scientific output is highly cited with an h-index of 161. He has received the Ipsen, Wilhelm Feldberg and Klaus Joachim Zulch prizes.

Formerly Foundation Professor of Cognitive Neurology at University College London (UCL), Director of the Department of Cognitive Studies (DEC) at the Ecole Normale Supérieure in Paris, Wellcome Trust Principal Clinical Research Fellow, Vice-Provost of UCL and Dean-Director of its Institute of Neurology, he also founded the Wellcome Department of Imaging Neuroscience and the FIL in 1994 where he is now an honorary professor. He finished his career in Lausanne where he created and headed the Department of Clinical Neurosciences at the Université de Lausanne (UNIL) and its Centre Hospitalier Universitaire Vaudois (CHUV) where he retains honorary appointments. Frackowiak has an MA and MD from Cambridge (Peterhouse), a DSc from London University, an honorary medical doctorate from Liege University. A Fellow of the Academies of Medical Sciences of the UK, France and Belgium, he is a member of the Academia Europaea and a foreign associate of the Institute of Medicine of the American Academies of Science and the Polish Academy of Sciences. He has served as president of the British Neuroscience Association and the European Brain and Behaviour Society and belongs to numerous national and European neurological societies. He was scientific advisor to the Director-General of INSERM in France and has held prestigious visiting professorships internationally, editorships and international society roles worldwide. He has always shown a commitment to Europe and had many advisory positions including chair of the Medical Sciences committee of Science Europe.

### **The Human Brain Project - The Impact of Informatics on Treatment of Brain Diseases**

We now know that a single human gene mutation may present with any of multiple phenotypes, and vice versa, that a range of genetic abnormalities may cause a single disease phenotype. These observations lead to the conclusion that a deeper understanding is needed of the way changes at one spatial or temporal level of brain organisation integrate and translate into others, eventually resulting in behaviour and cognition or their abnormalities. The basic idea is that it is now possible to look for rules underlying the functional and structural organisation of the human brain, exhaustively, at all spatial scales, and eventually perhaps at all spatio-temporal scales. The methodological approach is to federate and integrate existing knowledge from bottom up using recent advances in information technologies, notably supercomputing and distributed and interactive data basing. The theory is that rules and constraints determining a particular structural and functional organisation at one level will limit what organisations are possible at the next. It has, for example, been shown that one can construct in silico models that look and behave remarkably like their ex vivo counterparts, up to the level of the cortical column. The ambition therefore is to link genetic and proteomic levels by determining the rules that govern the segregation of protein expression. From protein expression we can start to extract rules that determine cellular morphology, which in turn predicts connectivity, and so on, until the mechanisms of emergent properties are discovered by a constructive process of predictive simulation, not as isolated modules but as interacting biological entities. The HBP's goal is to generate a draft

blueprint that describes how the brain is constructed across all levels. The blueprint will provide a framework within which new and old theories can be tested and new hypotheses generated. I will also touch on the implications of this novel approach for the classification and treatment of brain diseases.

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**Michael Fox**, Director of the Laboratory for Brain Network Imaging and Modulation, Beth Israel Deaconess Medical Center, **Harvard Medical School**, Boston, USA

Michael Fox is an Assistant Professor of Neurology at Harvard Medical School, Associate Director of the Berenson-Allen Center for Noninvasive Brain Stimulation, Associate Director of the BIDMC Deep Brain Stimulation Program, and Assistant Neuroscientist at Massachusetts General Hospital. He has a bachelor's degree in electrical engineering, PhD in systems neuroscience, MD with board certification in Neurology, and specialty training in movement disorders and brain stimulation. Dr. Fox's research focuses on developing new treatments for neuropsychiatric disease based on understanding brain networks and the effects of brain stimulation. He has authored numerous highly cited articles in the fields of brain imaging and brain stimulation and won several awards for his work including the S. Weir Mitchel Young Investigator Award from the American Academy of Neurology and recognition as one of the "World's Most Influential Scientific Minds" by Thompson-Reuters in 2014.

### Using the Human Connectome to Understand Neurological Symptoms and Guide Treatment

The past decade has seen tremendous investment towards identifying a wiring diagram for the human brain. This map of the brain's structural and functional connections, or human connectome, has the potential to advance systems neuroscience the same way the human genome map advanced genetics. But how exactly does one use this wiring diagram to better understand, diagnose, or treat disease? In this talk I will show how one can use human connectome data to predict symptoms from strokes, identify the brain networks underlying neurological deficits, and select optimal targets for brain stimulation.

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**Rocío Sanchez-Carrión**, Institut Guttmann, Barcelona, Spain

Chair of **SESSION 3: WHAT BIOLOGICAL, PSYCHOLOGICAL AND ENVIRONMENTAL FACTORS INFLUENCE BRAIN DEVELOPMENT SINCE CHILDHOOD AND ACROSS THE LIFESPAN?**

Rocío Sánchez-Carrión has a degree in Psychology at Universitat Autònoma de Barcelona (UAB). Doctor of Neuroscience by the Universitat de Barcelona (UB). Master's Degree in Clinical Neuropsychology at Universitat Autònoma de Barcelona (UAB). Her main lines of expertise are Clinical neuropsychology, neuropsychology rehabilitation and cognitive stimulation, and attention, perception and memory disorders.

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**Janet Werker**, Professor and Canada Research Chair in the Department of Psychology at the **University of British Columbia**, Director of the Infant Studies Center, and a Senior Scientist in UBC's Centre for Brain Health, Vancouver, Canada

Janet F. Werker is Professor and Canada Research Chair in the Department of Psychology at the University of British Columbia, Director of the Infant Studies Center, and a Senior Scientist in UBC's Centre for Brain Health. Werker's research explores the perceptual foundations of, and experiential influences on, language acquisition in both monolingual and bilingual learning infants. Her over 150 papers and chapters using both behavioral and neuroimaging techniques, have appeared in prestigious journals including Science, Nature, Proceedings of the National Academy of Sciences, and the Journal of Neuroscience, as well as in the premier field specific journals. She is a Fellow of the Canadian Institutes for Advanced Research, the Royal Society of Canada, the Canadian Psychological Association, The American Psychological Society, the Cognitive Science Society, the American Association for the Advancement of Science, and the American Academy of Arts and Sciences.

### Perceptual Foundations of Language Acquisition

The process of language acquisition begins in perceptual development long before infants produce or even understand, their first words. In this talk, I will review the rapid changes in auditory, visual, and multimodal speech perception that occur in the first months of life as infants establish a foundation for language acquisition. I will then present evidence that, while under typical circumstances the timing of perceptual attunement seems to be constrained by maturation, there are identifiable variations in experiences that can accelerate, slow down, or modify this developmental trajectory. Finally, I will introduce new questions about whether or studies to date on the timing of plasticity have considered all the relevant input systems. The implications of these findings for better understanding language development in both typically developing and atypical populations will be considered.

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**Elisenda Eixarch**, Coordinator of the Brain Connectivity Research Line, Fetal i+D Fetal Medicine Research Center, **IDIBAPS-University of Barcelona**, Spain

Specialist in Maternal-Fetal Medicine in Hospital Clinic of Barcelona and Post-doctoral researcher at Fetal i+D Fetal Medicine Research Center. She has got her degree in Medicine in (Universitat Autònoma de Barcelona) and her specialty and PhD in Universitat de Barcelona. She has focused her investigation on the effects of intrauterine growth restriction (IUGR) on brain development in both clinical and basic research. She works with a rabbit model of IUGR applying high resolution imaging techniques. In humans, she is interested in the developing of imaging biomarkers of abnormal neurodevelopment based in connectomic analysis of structural and functional brain networks. She

also works in the assessment of brain sulcation by means of ultrasound and fetal MRI. She is member of several scientific societies: International Society of Ultrasound in Obstetrics and Gynecology, Catalan Society of Obstetrics and Gynecology.

### **Prenatal Origins of Abnormal Brain Development**

It is known that around 10% of the babies will present altered neurodevelopment during their childhood. Great part of cases has its origin during prenatal life and several perinatal conditions have been related with this altered neurodevelopment, such as prematurity or intrauterine growth restriction. In the last years, and due to the use of advanced techniques of magnetic resonance, structural and functional brain changes underlying this altered function have been found. These changes, that are not evident in current evaluation of brain structure, have demonstrated that prenatal factors could produce differences in brain development, or so call “brain reorganization”.



**Ghislaine Dehaene-Lambertz**, Pediatrician, Director of the Developmental Brain Imaging Lab, **INSERM U992**, Gif sur Yvette, France

Dehaene-Lambertz is a CNRS full-time associate researcher (DR1). She investigates the development of cognitive functions in infants and children using brain imaging techniques. Her goal is to understand how complex cognitive functions, such as language, music, mathematics, etc... emerge in the human brain. She published pioneering work using high-density event-related potentials (Nature 1994), functional resonance magnetic imaging (Science 2002) or optical topography (PNAS 2003-2013) to study language acquisition, and the neural signatures of consciousness in the infant brain (Science 2013). She is the recipient of several national and international awards (Prix Justine and

Yves Sergent 2013) and has published two book for a general audience with P. Picq., L. Sagart and C. Lestienne “La plus belle histoire du langage”, translated in Arabic, Catalan, Portuguese, Chinese, Korean, Romanian and Turkish and “Apprendre à lire, ce que disent les sciences cognitives” (2011) with S. Dehaene, C. Huron and L. Sprenger-Charolles.

### **How Environment Takes Advantage of Biological Constraints to Shape Early Brain Development**

Whatever the historical period and culture, humans not only succeed to learn their cultural environment but are able to invent new solutions to old and new problems. The success of our species relies on its renewed inventiveness and children are the best examples of this fast and efficient learning. Although human brain development extends over two decades, the roots of its cognitive successes are already observed during infancy. The development of brain imaging techniques have permitted to study the human brain from birth on to look for the reasons of these successes: I propose that the strong continuity between infant and adult brain organization with notably an early involvement of frontal regions, and an heterogeneous maturation might be the key elements to obtain the best from our environment.

# INVITED SPEAKERS

Wednesday, October, 7<sup>th</sup>, 2015

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**Eduard Vieta**, Professor of Psychiatry, **University of Barcelona**; Chair of the Department of Psychiatry and Psychology, **Hospital Clínic**, Barcelona, Spain

Chair of the **SESSION 4: WHAT ARE THE RIGHT INTEGRATIVE APPROACHES TO CHARACTERIZE AND MODULATE BRAIN FUNCTION?**

Eduard Vieta is Professor of Psychiatry at the University of Barcelona and Chair of the Department of Psychiatry and Psychology at the Hospital Clinic, where he also leads the Bipolar Disorders Program in Barcelona, Catalonia, Spain. His unit is one of the worldwide leaders in clinical care, teaching and research on bipolar disorder. Dr. Vieta is the current Director of the Bipolar Research Program at the Spanish Research Network on Mental Diseases (CIBERSAM). He has received the Aristotle award (2005), the Mogens Schou award (2007), the Strategic Research award of the Spanish Society of Biological Psychiatry (2009), the Official College of Physicians award to Professional Excellence (2011), the Colvin Price on Outstanding Achievement in Mood Disorders Research by the Brain and Behaviour Research Foundation (2012), and the Clinical Neuroscience Lilly award by the International College of Neuropsychopharmacology (CINP 2014). He has been named best psychiatrist in Spain (Monitor sanitario) and he is currently the treasurer of the European College of Neuropsychopharmacology (ECNP). He has authored more than 600 original articles, 370 book chapters and 32 books. His H index is 73 and has over 20000 citations, which makes him the most cited scientist worldwide in the field of bipolar disorder over the last 5 years and one of the world's most influential scientific minds, according to Thompson Reuters. Furthermore, he is on the editorial board of many scientific journals and has served as invited professor at McLean Hospital and Harvard University and as neuroscience scientific advisor to the European Presidency.

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**Arthur Kramer**, Director of the Beckman Institute for Advanced Science & Technology and the Swanlund Chair and Professor of Psychology and Neuroscience at the **University of Illinois**, Champaign, USA

He received his Ph.D. in Cognitive/Experimental Psychology from the University of Illinois in 1984. He holds appointments in the Department of Psychology, Neuroscience program, and the Beckman Institute. Professor Kramer's research projects include topics in Cognitive Psychology, Cognitive Neuroscience, Aging, and Human Factors. A major focus of his labs recent research is the understanding and enhancement of cognitive and neural plasticity across the lifespan. He is a former Associate Editor of Perception and Psychophysics and is currently a member of six editorial boards. Professor Kramer is also a fellow of the American Psychological Association, American Psychological Society, a former member of the executive committee of the International Society of Attention and Performance, and a recipient of a NIH Ten Year MERIT Award. Professor Kramer's research has been featured in a long list of print, radio and electronic media including the New York Times, Wall Street Journal, Washington Post, Chicago Tribune, CBS Evening News, Today Show, NPR and Saturday Night Live.

## Exercising Your Mind & Brain

In my presentation I will review research conducted in our laboratory, and the field in general, which has examined the extent to which fitness training and physical activity enhances cognition and brain structure and function of adults. The presentation will cover both cross-sectional and intervention studies of fitness differences and fitness and physical activity training. Studies which assess cognition via both behavioral measures and non-invasive neuroimaging measures, such as magnetic resonance imaging, functional magnetic resonance imaging, event-related brain potentials, and the event-related optical signal, will be reviewed and discussed. Finally, I will explore the gaps in the human and animal literature on cognitive and brain health and the manner in which they can be addressed in future research.

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**Daphne Bavelier**, Group Leader at **University of Geneva**, CH; and Research Professor, **Rochester University**, Rochester, USA

Daphne Bavelier is an internationally-recognized expert on how humans learn. In particular, she studies how the brain adapts to changes in experience, either by nature - for example, deafness - or by training - for example, playing video games. Initially trained in Biology at the 'Ecole Normale Supérieure de Paris', she then received a PhD in Brain and Cognitive Sciences from MIT and trained in human brain plasticity at the Salk Institute. Her work shows that playing fast-paced, action-packed entertainment video games typically thought to be mind-numbing actually benefits several aspects of behavior. Exploiting this counter-intuitive finding, her lab now investigates how new media, such as video games, can be leveraged to foster learning and brain plasticity.



## Action Videogames as Exemplary Learning Tools

Technology, from chatting on the internet to playing video games, has invaded all aspects of our lives and, for better or for worse, is changing who we are. Can we harness technology to effect more changes for the better? Yes we can, and not always in the way one might have expected. In a surprising twist, a mind-numbing activity such as playing action video games appears to lead to a variety of behavioral enhancements in young adults. Action video game players outperform their non-action-game playing peers on various sensory, attentional and cognitive tasks. A training regimen whose benefits are so broad is unprecedented and provides a unique opportunity to identify factors that underlie generalization of learning and principles of brain plasticity. We propose that a common mechanism is at the source of this wide range of skill improvement. In particular, improvement in performance following action video game play may result from greater attentional control with gamers focusing on signal and ignoring distraction more efficiently. Practical applications from education to rehabilitation will be discussed.



**Emilio Ros**, Director of the Lipid Clinic and Senior Consultant, Endocrinology & Nutrition Service, **Hospital Clínic**, University of Barcelona, Barcelona, Spain

Team Leader of the research group “Hypertension, lipids and cardiovascular risk”, IDIBAPS, Barcelona; and Principal Investigator of one of the research groups in CIBER Fisiopatología de la Obesidad y Nutrición, Instituto de Salud Carlos III. Postgraduate training in USA, New York and Boston (1970-1976). American Board of Internal Medicine and American Board of Internal Medicine, subspecialty Gastroenterology, Boston 1973-75. Member, founder and ancient vicepresident of the Spanish Atherosclerosis Society (SEA). Member of the European Atherosclerosis Society (EAS) and International Atherosclerosis Society. Ancient President, of the Sociedad Iberoamericana de Aterosclerosis (SILAT). Founder and ancient editor of *Clínica e Investigación en Arteriosclerosis*, official journal of SEA. First editor, *Br J Nutr*. Editorial Board, *Metabolism*. Award to best scientific career in Nutrition, Fundación Danone 2013. Grande-Covian Award for a life career in Nutrition, SEA 2014. Golden Nut Award, International Nut Council 2014. Actual research interests include nutrition in the prevention of cardiovascular diseases and age-related cognitive deterioration, with especial interest in the Mediterranean diet and walnuts; plant sterols; blood membrane fatty acids; genetic dyslipidemias; cardiovascular risk assessment; and vascular imaging techniques, especially carotid ultrasound. He also led the nutritional intervention of the landmark PREDIMED trial of Mediterranean diet for primary cardiovascular prevention. He has published more than 275 original papers, over 115 reviews papers, 25 editorials, and 85 scientific textbook chapters.

### The Mediterranean Diet and Improved Cognitive Outcomes: Evidence from the PREDIMED Trial

Alzheimer disease (AD) and related types of dementia are devastating diseases with incidence rates that are increasing exponentially due to increasing longevity. In spite of much epidemiological, clinical, and experimental research, at present there are still no effective strategies to prevent AD, delay its onset or, least of all, cure the disease. As in many age-related conditions, oxidative stress leading to chronic inflammation plays a major role in age-related neurodegeneration, attendant cognitive decline, and progression to dementia. Oxidative stress is counteracted by antioxidants, which are integral components of vegetable foods. In accordance, antioxidants and improved nutrition have long been considered as potential strategies to delay cognitive decline and/or prevent progression to AD, but clinical evidence is very limited. Given that the Mediterranean diet (MeDiet) is a plant-based, antioxidant-rich dietary pattern, there are fair grounds to believe that long-term adherence might protect against cognitive decline and AD. Indeed, epidemiological evidence for the effectiveness of the MeDiet in slowing cognitive decline and reducing AD risk is accumulating. The PREDIMED trial tested the efficacy of supplemented MeDiets to prevent cardiovascular diseases and other outcomes, among them cognitive decline, in older individuals at high cardiovascular risk. Using a battery of neuropsychological tests we cross-sectionally assessed 447 participants and found that higher consumption of some polyphenol-rich foods characteristic of the MeDiet, namely wine, virgin olive oil, and walnuts, independently related to better cognitive outcomes. The follow-up of this cohort for nearly 4 years with repeated cognitive assessments revealed that the Mediterranean diet counteracted age-related cognitive decline compared with a control diet based on advice to reduce dietary fat. The effect of the MeDiet on incidence of neurodegenerative disease, a secondary outcome of the PREDIMED trial, will be known in the near future. Thus far, data from PREDIMED suggests that the MeDiet provides optimal food for the brain.



**Bonnie Wong**, Neuropsychologist, Division of Cognitive Neurology, Beth Israel Deaconess Medical Center, **Harvard Medical School**, Boston, USA

Dr. Bonnie Wong is a board-certified clinical neuropsychologist in the Division of Cognitive Neurology at Beth Israel Deaconess Medical Center, Harvard Medical School. In addition to providing diagnostic assessments, and individual and group treatment to individuals with cognitive impairments, she co-developed and is director of the Brain Fit Club. Dr. Wong has published scientific articles in the areas of memory disorders, cognition in healthy aging, and social cognition. Her current research focuses on the effects of normal aging and long-term outcomes of cognitive remediation.

## Evidence-Based Brain Health Approaches in Practice: The Brain Fit Club

A joint initiative of the Cognitive Neurology Unit and Berenson-Allen Center for Noninvasive Brain Stimulation at Beth Israel Deaconess Medical Center, the Brain Fit Club (BFC)<sup>TM</sup> is a clinical and translational research program that provides evidenced-based interventions to patients and healthy individuals. The clinical program provides patients with tailored suites of interventions predicated on objective neuropsychological and neurophysiological measurements of brain functioning. Since its inception in 2013, the BFC has seen over 450 patients in an evaluative and interventional/treatment capacity. This presentation will review the major components of the BFC's clinical program, including assessment tools and interventions, characterize its patient population, and present data on patient utilization of services and preliminary data relevant to treatment efficacy.

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**Àngels Bayés**, Director of the Unit for Movement Disorders and Parkinson, **Teknon Medical Center**, Barcelona, Spain

Chair of the **SESSION 5: WHAT ARE THE CLINICAL, PUBLIC HEALTH AND EDUCATIONAL IMPLICATIONS OF BRAIN HEALTH, PREVENTION AND LONG TERM CARE?**

Àngels Bayés Rusiñol MD, Doctor in Medicine, Neurology specialist. She has focused his career and research on the treatment and study of Parkinson's disease, Tourette syndrome and dementias such as Alzheimer's disease. His main areas of research are related to the implementation of complementary therapies, psycho-education and improving the quality of life of patients suffering from movement disorders, through the application of new technologies. In the last five years, he has teamed up with engineers to develop support systems for mobility. She is director of the Unit for Movement Disorders and Parkinson of Teknon Medical Center during the last 20 years. She has participated in 39 research projects, 2 from European Commission, has 59 publications, author of 6 books, in addition to lectures, conferences, communications and teaching courses.

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**Jaime Kulisevsky**, Director of the Research Institute of **Sant Pau Hospital**, Associate Professor **Autonomous University of Barcelona**, and Research Professor at **Open University of Catalonia**, Barcelona, Spain

Jaime Kulisevsky is Associate Professor of Neurology at the Autonomous University of Barcelona, Research Professor at the Open University of Catalonia and Director of the Movement Disorders Unit of the Sant Pau Hospital in Barcelona, Spain. He is also the Director of the Research Institute of this Hospital. He conducts clinical research in Parkinson's disease and other movement disorders. His main research interest has been the cognitive and behavioral consequences of basal ganglia dysfunction in Movement Disorders and the impact of antiparkinsonian treatment on cognition and behavior in Parkinson's disease. He has been member of the International Movement Disorders Society Task Force for Developing Rating Scales in Parkinson's Disease (Subcommittee for Cognitive Evaluation) and of the Task Force for Mild cognitive Impairment in Parkinson's Disease. He acts as the Spanish Coordinator of the European Huntington's Disease Network and the ENROLL study (CHDI). He has been awarded with the Research Prize of the Spanish Society of Neurology, has been Principal Investigator of several public research grants and industry-sponsored studies, as well as Principal Investigator of the Spanish Biomedical Network Research Centre for Neurodegenerative Diseases (CIBERNED-Instituto de Salud Carlos III).

### Brain Health in Neurodegenerative Disease

The strong link between neurodegenerative diseases and older age, together with the notable increase in life expectancy around the world has meant that the occurrence of Alzheimer's disease and related dementias, Parkinson's disease and Vascular Dementia appear as a strong threat, both for individual successful aging and for the wealth of developed and underdeveloped countries. Although we have to separate normal aging from specific pathologies that have complex epidemiological and genetic interactions, there is increasing evidence indicating that the even the 'diseased' brain retains a considerable functional plasticity and that some active measures that help to preserve the healthy brain (such as healthy diet, aerobic exercise, social activities, or cognitive stimulation) may also impact the clinical course of neurodegenerative diseases and delay the presentation and severity of cognitive impairment. In this presentation we are going to deal with some examples of the increasing interest and results on implementing such strategies in neurodegeneration with special focus on Parkinson's disease, which is presently considered the main risk factor to present dementia among the general population.

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**Margaret Moore**, Harvard University Extension School; Co-Founder/Co-Director, Institute of Coaching, McLean Hospital, Co-Founder/Board member, National Consortium for Credentialing Health & Wellness Coaches; Founder, CEO, Wellcoaches Corporation, Boston, USA

Margaret Moore is a 17-year veteran of the biotechnology industry in the US, UK, Canada, France. She served in executive roles at three companies that later joined Sanofi, and as CEO and COO of two biotech companies. In 2000, Margaret founded Wellcoaches School of Coaching, in strategic partnership with the American College of Sports Medicine, which has trained more than 9,000 health professionals as health and wellness coaches in 45 countries. Margaret is co-founder and co-director of the Institute of Coaching at McLean Hospital, a Harvard Medical School affiliate, and co-director of the annual Coaching in Leadership & Healthcare conference offered by Harvard Medical School. Margaret teaches a science of coaching psychology program at Harvard University Extension School. She co-founded and co-leads the National Consortium for Credentialing Health & Wellness Coaches. Margaret is co-authored the Coaching Psychology Manual published by Lippincott, Williams, & Wilkins, and a Harvard Health book titled Organize Your Mind, Organize Your Life, translating neuroscience into self-coaching solutions. Her executive coaching practice is dedicated mainly to healthcare leaders.

### **Coaching the Brain for Good**

Coaching psychology, sometimes called coaching science, emerging in the past 20 years, has translated and integrated multiple evidence-based theories into coaching competencies, including self-determination theory, social cognitive theory, motivational interviewing, behavior change theories, adult development, mindfulness, emotional intelligence, self-compassion, and self-regulation. One can describe coaching as "coach-facilitated, self-directed neuroplasticity," and the work of coaches as helping people foster the ideal conditions for brain learning, insight, change and growth in order to outgrow old mindsets and behavior patterns. A new field of health and wellness coaches, soon to have national standards and certification in North America, is emerging to assist people in engaging in healthy lifestyles which prevent and ameliorate chronic diseases, as well as improve brain health and performance. Executive leadership coaches are beginning to address brain health and performance as a leadership attribute that fosters peak performance. This presentation will provide an overview of coaching tools and processes which foster brain performance, including mindfulness, focused attention, collaboration, creativity, agility, and over time improve brain health via improved brain function and healthy lifestyles.

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# PRACTICAL INFORMATION

## Debates Venue

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### CosmoCaixa Barcelona

Sala Àgora

C/ Isaac Newton, 26 08022 Barcelona, Spain

[obrasocial.lacaixa.es/laCaixaFoundation/home\\_en.html](https://obrasocial.lacaixa.es/laCaixaFoundation/home_en.html)



**CosmoCaixa** offers interactive, enjoyable science and an open door for anyone who is eager to learn and understand and who never stops wondering why things are the way they are. **CosmoCaixa Barcelona** boasts the Geological Wall and the Amazon Flooded Forest, which features more than 100 plant and animal species that convince visitors they have been transported from the Mediterranean to the very heart of the tropical jungle. In addition to its permanent facilities and its open areas, CosmoCaixa offers a scientific and educational programme that includes exhibitions, workshops, conferences, courses and debates involving experts from all over the world.

More info: [obrasocial.lacaixa.es](https://obrasocial.lacaixa.es)

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## Contact person during the event

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### Laia Arnal

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[www.bdebate.org](http://www.bdebate.org) | [www.biocat.cat](http://www.biocat.cat)

# ADDITIONAL INFORMATION

## Suggested Reading

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**Efficiency, capacity, compensation, maintenance, plasticity: emerging concepts in cognitive reserve.**

Barulli D, Stern Y.

Trends Cogn Sci. 2013 Oct;17(10):502-9. doi: 10.1016/j.tics.2013.08.012. Epub 2013 Sep 7.

**Changes in plasticity across the lifespan: cause of disease and target for intervention.**

Oberman L, Pascual-Leone A.

Prog Brain Res. 2013;207:91-120. doi: 10.1016/B978-0-444-63327-9.00016-3.

**Brain plasticity through the life span: learning to learn and action video games.**

Bavelier D, Green CS, Pouget A, Schrater P.

Annu Rev Neurosci. 2012;35:391-416. doi: 10.1146/annurev-neuro-060909-152832.

**Exercise, brain, and cognition across the life span.**

Voss MW, Nagamatsu LS, Liu-Ambrose T, Kramer AF.

J Appl Physiol (1985). 2011 Nov;111(5):1505-13. doi: 10.1152/jappphysiol.00210.2011. Epub 2011 Apr 28.

**Critical periods in speech perception: new directions.**

Werker JF, Hensch TK.

Annu Rev Psychol. 2015 Jan 3;66:173-96. doi: 10.1146/annurev-psych-010814-015104. Epub 2014 Sep 17.

**Great Expectations: Using Whole-Brain Computational Connectomics for Understanding Neuropsychiatric Disorders.**

Deco G, Kringelbach ML. 2014. Neuron. 84(5):892-905.

**Genetic and Environmental Influences on the Visual Word Form and Fusiform Face Areas.** Philippe

Pinel, Christophe Lalanne, Thomas Bourgeron, Fabien Fauchereau, Cyril Poupon, Eric Artiges, Denis Le Bihan, Ghislaine Dehaene-Lambertz, and Stanislas Dehaene. Cereb Cortex, May 2014.

**Primary Prevention of Cardiovascular Disease with a Mediterranean Diet** Ramón Estruch, M.D., Ph.D.,

Emilio Ros, M.D., et al. for the PREDIMED Study Investigators N Engl J Med 2013; 368:1279-1290 April 4, 2013



# OUTCOMES

## B·Debateca

On the website of **B·Debate**, you will find all the information related with the celebration of the meeting that includes reports, conclusions, scientific documents, interviews with the experts, speaker's CVs, videos, images, press documentation and other related materials. We invite you to visit the section **B·Debateca** on [www.bdebate.org](http://www.bdebate.org)

Contents of the meeting "**BRAIN HEALTH. FROM GENES TO BEHAVIOR, IMPROVING OUR LIFE**"

The screenshot shows the B·Debate website interface. At the top, there's a header with the B·DEBATE logo (International Center for Scientific Debate, BARCELONA) and logos for AN INITIATIVE OF: bilocat and la Caixa Foundation. Below the header is a navigation bar with tabs: HIGHLIGHTS, B-DEBATE, CALL FOR PROPOSALS, B-DEBATECA (circled in blue), NEWS, and CONTACT. Under B-DEBATECA, there's a filter bar with DEBATE (Brain Health, circled in blue), CONTENTS (All), TOPICS (All), and DATE (All). Below the filter bar, there's a list of speakers and topics. The first topic is "06/10/2015 Brain Health. From Genes to Behaviour, Improving Our Life" with a subtext "In the last 50 years, the number of deaths in the United States for cardiovascular... More". Below this, there are speaker cards for Michael Fox (BIDMC - Harvard Medical School), John Hardy (University College London), Hermano Igo Krebs (Institut de Tecnologia de Massachusetts (MIT)), Richard Frackowiak (CENTRE HOSPITALIER UNIVERSITAIRE VAUDOIS), Gustavo Deco (Universitat Pompeu Fabra), Ghislaine Dehaene-Lambertz (Institut National de la Santé et de la Recherche Médicale), Janet Werker (University British Columbia), Elisenda Eixarch, and Arthur Kramer. Each speaker card includes a photo, name, and affiliation, and a red plus icon in the top right corner.

## Follow Us on Social Media



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#BrainHealthBD

# ORGANIZERS

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International Center  
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**BARCELONA**

AN INITIATIVE OF:



**B-Debate** International Center for Scientific Debate Barcelona is a **Biocat** initiative with support from “**la Caixa**” **Foundation**. It drives first-rate international scientific debates, to foster dialogue, collaboration and open exchange of knowledge with prestigious national and international experts, to approach complex challenges of high social interest in life sciences. B-Debate sees debate as a powerful, effective way to generate knowledge and strives to help position Barcelona as a benchmark in generating knowledge and Catalonia as a country of scientific excellence.

B-Debate sees debate as a powerful, effective way to generate new knowledge. The debates are top-notch international scientific meetings featuring a selection of experts of renowned international prestige and scientists that work in Barcelona and Catalonia, moderated by scientific leaders. Since 2009 B-Debate has organized more than 50 meetings, invited about 1200 recognized speakers and over 7.000 attendees. B-Debate seeks out answers to the challenges and needs of society in the field of life sciences, taking into account the complex, ever-changing conditions of this global world. The debates foster the integration of different disciplines of science and deal with such diverse topics as ageing, new therapeutic approaches to various diseases, innovative technology to improve knowledge of the human genome, food resources, new tools to integrate knowledge management, clinical genomics, neurosciences, climate change, and new energy sources, among others. The knowledge and results obtained through these events is spread throughout both the scientific community and general society through the various **B-Debate** channels and instruments.

More info: [www.bdebate.org](http://www.bdebate.org)

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The **Institut Guttmann-Neurorehabilitation Hospital** is a specialized hospital in the medical and surgical treatment and comprehensive rehabilitation of people with spinal cord injury, acquired brain injury or other neurological disabilities. Its main objective is to provide specialized, comprehensive, continuous, personalized care, incorporating the highest levels of science, technology and compassion. Its characteristic care model is based on the intervention of an expert multidisciplinary team, the compassion and specialization of its professionals, and the scientific rigor with which it operates; together with modern facilities and the continuous incorporation of the latest technology, these make the Institut Guttmann one of the world's leading hospitals in its field today. The care and neurorehabilitation activity of the Institut Guttmann is organized by functional units and clinical programs for the rehabilitation of patients, as well as a number of specific clinical procedures able to bring significant qualitative improvements in the health field and in the improvement of the quality of life of those affected by a neurological disability. The Institut Guttmann is accredited as a University Institute attached to the Universidad Autònoma de Barcelona (UAB), as a University Institute, its mission is to develop academic, scientific and research issues in neuroscience in general and in neurorehabilitation and technologies applied to personal autonomy in particular. The overlap between the Specialized Hospital -Centre of Excellence- and the University Institute of Neurorehabilitation - Knowledge Centre- enables optimization of the generation and transfer of new knowledge in this specialized field of science. Its vision is to be an international leader in neurorehabilitation, able to generate and transmit new knowledge and continuous innovation in techniques, procedures and technologies appropriate to its field of scientific knowledge and to neuroscience in general. This is done by promoting a network of cooperation open for the participation of other centers of excellence, universities, research institutes, companies and organizations, both national and international, who want to combine their efforts in order to improve prevention and results in the treatment of diseases that affect the central nervous system.

This year, the **Institut Guttmann** is celebrating **50 years** since it was founded and it does so with a maxim that expresses an idea, a wish, a drive... the exciting and inspiring dream that has gelled us together as an organization all these years that has made us better people and better professionals. We would like to take this opportunity to pay homage to those that have come before us in this work but, most of all, we want to renew our commitment to the future. We wish a better future for our patients, their families, as well as for our country and for society as a whole.

More info: [www.guttmann.com/en](http://www.guttmann.com/en) <http://www.guttmann.com/en/actos-aniversario>

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# COLLABORATORS

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**Guttmann, NeuroPersonalTrainer®** is an initiative of Institut Guttmann, in cooperation with technological partners and a cohort of recognized expert in neurological and psychiatric disorders, to provide intensive, personalized, evidence based cognitive training to people suffering cognitive deficit from different aetiologies, with the most advanced knowledge from cognitive neuroscience. The system optimizes the time of dedication of health professionals through an asynchronous connection model, increases the personalization and intensity of treatments, provides automatic monitoring of the performance and real time adjustment of the level of difficulty based on the rate of success in each exercise, and provides instant information on the results and guidance about the most appropriate therapeutic options, according to the characteristics and progress of each patient. Guttmann, NeuroPersonalTrainer® is available for patients suffering cognitive deficit as a result of early dementia or mild cognitive impairment; acquire brain damage (stroke, traumatic brain injury, etc), brain tumours, neurodegenerative diseases (Parkinson disease, Multiple Sclerosis, etc.); children suffering cognitive problems because of congenital or acquire disorders (Cerebral palsy, Traumatic brain injury, Anoxia, Tumor, Epilepsy, Neurodevelopmental disorders, Learning difficulties, Attention deficit hyperactivity disorder-ADHD, Autism spectrum disorder-ASD, etc.); and in immediate future, for people suffering mental health problems (Schizophrenia, Schizoaffective disorder, Bipolar disorder, etc.) and also for children or adults suffering an intellectual disability. In our days, more than 3.500 patients have benefited from the treatment, more than 110,000 sessions and 625,000 exercises have been performed. From these data, we observed that 72% of the users, who completed the twelve weeks' program of intensive, personalized and monitored treatment, showed a significant cognitive improvement.

More info: [www.gnpt.es](http://www.gnpt.es)

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The **Abertis Foundation** is active in three key spheres (social, cultural and environmental), and works to mitigate the impact of the Abertis Group's activity in the countries in which it operates. Its commitment to society is highlighted by an extensive road safety programme primarily targeting the most vulnerable drivers and pedestrians. The Abertis Foundation's activities in the area of culture involve partnerships with leading cultural institutions around the world. Regarding environmental protection, its Castellet Castle headquarters are a UNESCO Centre on Mediterranean Biosphere Reserves. The Foundation also channels some of Abertis' sponsorships and plays a coordinating role with regard to the corporate social responsibility activities of the group's businesses.

More info: [www.fundacioabertis.org/eng/index.php](http://www.fundacioabertis.org/eng/index.php)

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**BILAT 2.0 USA** is a project funded by the European Union under FP7. It is a bilateral coordination activity to enhance and develop science, technology and innovation partnerships between the European Union and the United States of America. BILAT-USA 2.0 has three main goals:

- Support the political dialogue within the framework of the EU-US STI cooperation agreement
  - Enhance the cooperation between scientists and innovation actors on both sides and spread information on funding possibilities through a number of workshops & events
  - Analyze the state-of-the-art and the progress of transatlantic science and technology cooperation
- BILAT 2.0 USA is a multisectorial project focus on: Marine and Arctic Research, Transport, NM (Nanosciences, nanotechnologies, materials and new production technologies) and Health. In the project Biocat develops activities in these two last sectors.

More info: [www.euussciencetechnology.eu](http://www.euussciencetechnology.eu)



Brain Fit Club™

The **BIDMC Brain Fit Club** (BFC) at Harvard Medical School is a first-of-its kind facility designed to meet the cognitive challenges of growing life expectancy, age-related cognitive changes, and cumulative brain injury and insult by capitalizing on new research regarding the growth and adaptability of the human brain. The focus is not just on novel strategies for brain and mind restoration, but also prevention. The BFC uses evidence-based neuropsychological and neurophysiological evaluation techniques to tailor brain-health regimens to individual patients. It prescribes an integrated, individually tailored set of interventions from a broad and growing suite that includes brain stimulation, physical activities, computerized cognitive training, music-based therapies, and others. The BFC operates as a sustainable clinical program, offers a fruitful platform for new research activity, and in partnership with Harvard University Faculty of Arts and Sciences, is in the process of developing an educational curriculum in the field of wellness and brain health coaching.

More info: [www.brainfitclub.org](http://www.brainfitclub.org)

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VENUE:

**CosmoCaixa Barcelona**  
C/ Isaac Newton, 26  
08022 Barcelona



International Center  
for Scientific Debate  
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